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APPLICATIONS OF DUAL SATELLITE POSITIONING SATELLITES IN NATIONAL ECONOMIC CONSTRUCTION

by

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In the middle 1980's, internationally, there appeared a type of enterprise called a dual satellite positioning system (RDSS). In 1987, the International Telecommunications Union (ITU) approved the enterprise in question. In conjunction with this, operating frequencies associated with RDSS were distributed.

RDSS is composed of three parts--two geosynchronous satellites separated from each other by a fixed angle (30°-60°) (dual satellite positioning satellites) as well as a central ground station and various types of user facilities. As is shown in the appended Fig., due to the fact that the positions of central ground stations and dual satellite positioning satellites are already known, it is, therefore, only necessary to measure the time delay (distance) from user facilities to the two satellites and make use of the already known elevations, and it is then possible to determine the position of user equipment. The elevation of user equipment can be obtained from electronic maps existing in computers beforehand or altimeters located in user equipment.

Operating processes associated with dual satellite positioning systems can be simply described as follows. Central stations transmit query signals through satellite 1 into satellite 2 coverage areas. It is necessary for the positioned user equipment to then reply to this query signal. The query signal response in question passes at the same time through the two satellites to reach the central station. The central station calculates the location of the user equipment in question and, after that, is just on the verge of notifying the user equipment requiring positioning of this location information through satellite 1. If communication is carried out between users, it is then necessary to repeat through the central station. This resembles the general star shaped communications net. There is a "two jump" process.

Dual satellite positioning systems possess the four characteristics below. User terminals are simple and inexpensive. System capacity is large. They are capable of operating under minimum limiting conditions and minimum levels of complexity. They possess high precision positioning and auxilliary digital communications functions. Therefore, dual satellite positioning satellites are capable of being one of the satellites with the broadest range of applications among satellites today. Applied systems composed of this type of satellite possess all weather, high precision, real time positioning and communications functions. No matter whether it is on land, on the sea, or in the air, in all cases, there are uses for them.

I. APPLICATIONS ON LAND

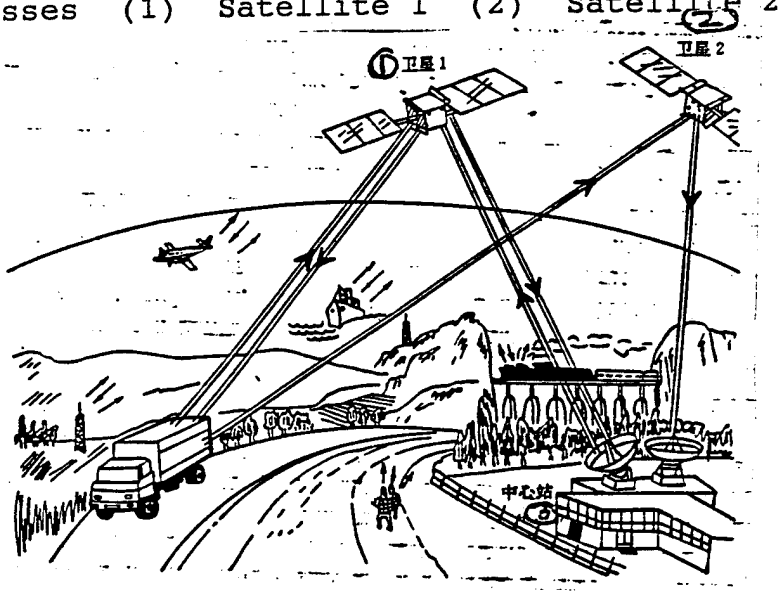
As far as ground applications associated with dual satellite positioning satellites are concerned, the area which stands out the most is that they are capable of use with mobile subscribers.

On land, railroad rolling stock, trucks, cars, as well as vessels in rivers are all capable of making use of them.

(1) Railroads

With regard to railroads making use of this type of dual satellite positioning system, it is possible to develop new forms of enterprises associated with dynamic railroad blockages. On the basis of our demonstrations, it is believed that time intervals associated with trains can, as a minimum, be shortened to half their current values (8 minutes). This is equivalent to taking the currently existing railroad lines and doubling them, that is, one railroad becomes two railroads, making railroad transport capabilities increase one fold. This is a very considerable economic benefit. Besides this, as far as railroad utilization of dual satellite positioning systems is concerned, it is also possible to make railroad accidents drop to 1% of

Schematic Diagram of Dual Satellite Positioning Satellite Operational Processes (1) Satellite 1 (2) Satellite 2 (3) Central Station



/6

original values.

(2) Trucks

Dual satellite positioning systems are capable of providing long range communications and positioning enterprises for trucks. Truck owners are capable of grasping the whereabouts of vehicles (drivers) when necessary Freight owners are also capable of most effectively turning over their goods. When drivers meet with unexpected situations (for instance, trucks breaking down in the middle of nowhere), it is possible to send a report requesting rescue from the vehicle owner. The vehicle owner can immediately know where the vehicle is broken down and set up a way to organize a rescue. As far as dual satellite positioning systems are concerned, with regard to resolving social problems associated with motor vehicles traveling empty, they have quite a large role. Vehicle owners can, as necessary, notify trucks traveling empty after unloading cargo to go to new load origination points, thereby reducing the phenomenon of motor

vehicles traveling without cargo, economizing on power sources and reducing pollution.

(3) Communications with Isolated Routes

Dual satellite positioning systems are instantaneous communications systems associated with transmissions passing through satellites. As far as contact between two user devices is concerned, it is possible to complete it within a very short few seconds. This can then alter the backward situation associated with the need for telegrams in remote farming villages, livestock raising areas, and mountainous regions having to be delivered by postal personnel. It is only necessary for residential areas to lease the use of this system. It is then possible to bring to inhabitants in the vicinity extremely great conveniences.

II. APPLICATIONS ON THE SEA

As far as dual satellite positioning systems are concerned--with respect to applications at sea in the area of maritime affairs--according to the report provided in 1986 by the U.S. maritime radio technology committee, there can at least be applications in the twenty or so areas below: advanced emergency position indicating radio beacons (EPIRB); vessel positioning; canal and water course control; anchorage monitoring and management; ship dispatching; sea area identification; speed boat competition monitoring; monitoring and management of oceanic garbage; management and dispatch of commercial shipping personnel; reconnaissance and mapping of earthquakes and bodies of water; dredging boundary identification; the setting up and replacement of navigation tools (floating navigation facilities); the monitoring and positioning of navigation tools; planning and management of search and rescue; the rendezvousing of vessels; positioning in case of mishap; searching for precious deposits; tracking weather balloons; tracking suspicious or highjacked ships; life jacket or life boat beacons; identification of disasterous or navigation blind areas; tracking oil spills, and so on.

III. AERIAL APPLICATIONS

The contributions which dual satellite positioning systems have made in the realm of flight are larger than the contributions in all the other fields. Communications and navigation are special characteristics of dual satellite positioning systems. They are also the foundation of safe flight.

"Communications, Navigation, and Aerial Survey" (CNS) is a common technical term used in association with the next period of aviation electronics anticipated by aviation circles. "Communications" refers to two way contact between aircraft and the ground. "Navigation" refers to flight crew personnel precisely determining aircraft positions and flight vectors

associated with assumed flight destinations. At the present time, there are only a few large aircraft on which one has navigation systems. "Aerial survey" refers to ground command personnel precisely determining positions of aircraft in the air. At the present time, this is completed through reports from ground radars, altimeters, as well as personnel on aircraft.

Dual satellite positioning systems are one integrated CNS system. It can be deployed on any aircraft in order to resolve problems associated with aircraft collisions as well as emergency positioning, which interest aviation circles.

IV. A NUMBER OF SPECIAL APPLICATIONS

(1) Public Security

Dual satellite positioning systems are a powerful tool for public security departments. The reason is that, during procedures to enforce laws to protect society, it is necessary, with regard to public security personnel, to carry out command, control, and communications. These are nothing else than what are called C3 functions. They are also ideal tools for telephoning warnings to urban populations.

(2) Preventing and Relieving Disasters

Various types of calamities often bring with them severe destruction of communications. The great Tangshan earthquake caused a majority of communications facilities to all be incapable of utilization. At times when communications are needed the most, communications are often the least unobstructed. This is because ground communications networks are, in and of themselves, relatively fragile. If it is not line breaks, then it is power supply circuit breaks. All that is required is for one location to develop problems, and it will then lead to disruption of the whole line. Moreover, during disasters, restoring of communications lines is extremely difficult. If there is a dual satellite positioning system, due to the fact that communications networks are in the air or on satellites, it is only necessary for dual satellite positioning system users to have battery power supplies. It is then possible to maintain normal communications. In 1987, the great Daxingan range forest fire was first warned of by satellite communications. Fire information was only received a few days later through other systems.

(3) Control of Toxic Substances

The primary objects control of toxic substances is aimed at are fissionable materials and toxic chemicals. The location of these materials at any instant as well as such information as any deviations from stipulated navigation routes and predicted arrival times has very great value in all cases for management departments. Dual satellite positioning systems possess the capability to satisfy this requirement. They are capable of becoming an important tool to control hazardous materials shipments.

(4) International Trade

Beginning roughly from just this year and next year, in international trade activities, option will be made for the use of electronic data exchange technologies. After developed countries opt for the use of electronic data exchange techniques, processing associated with paper trade documentation will be put in the back seat. With regard to nations which have still not opted for the use of electronic data exchange technologies, this will bring with it severe economic losses. Dual satellite positioning systems are capable of playing the role of medium in electronic data exchanges.

(5) Time Calibration Frequencies

Navigation positioning systems are always closely related to time and frequencies. High precision navigation positioning is built on a foundation of high precision time and frequencies. As a result, navigation positioning systems are always also time and frequency calibration systems. For instance, the famous Omega system, Loran system, Transit system, as well as the GPS system, and so on, are all this way. High positioning accuracies /7 associated with dual satellite positioning systems are built on a foundation of high time and frequency precisions. As a result, they are also capable of acting as a good time service system. Within frame structures, it is only necessary to do a little work, and, at the same time, on user recievers, set up a connection port having datum time signals outputed from hub station standard clocks. It is then possible to carry out time service and frequency calibration activities.

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